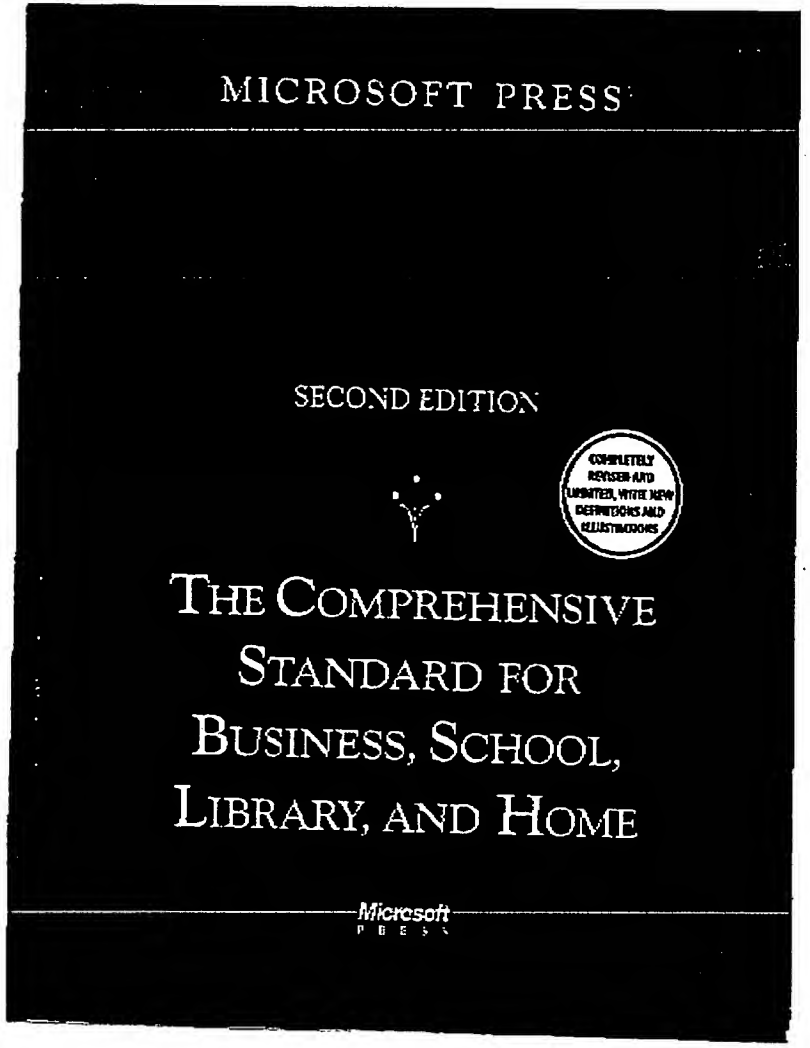
APPENDIX



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object A shorthand term for object code (machine-readable code); in object-oriented programming, a variable comprising both routines and data that is treated as a discrete entity. *See also* abstract data type, module, object code, object-oriented programming.

In graphics, a distinct entity. For example, a bouncing ball might be an object in a graphics program.

object code The code, generated by a compiler or an assembler, that was translated from the source code of a program. The term most commonly refers to machine code that can be directly executed by the system's central processing unit (CPU), but it can also be assembly language source code or a variation of machine code. *Compare* source code; *see also* assembly language, compiler.

object computer The computer that is the target of a specific communications attempt.

object file A file containing object code, usually the output of a compiler or an assembler and the input for a linker. *See also* object code.

Objective-C An object-oriented version of the C language developed in 1984 by Brad Cox. It is most widely known for being the standard development language for the NeXT system. *See also* object-oriented programming.

object linking and embedding *See* OLE.

object module In programming, the object-code (compiled) version of a source-code file, which is usually a collection of routines, ready to be linked with other object modules. *See also* linker, module, object code.

object-oriented An adjective applied to *any* system or language that supports the use of objects. *See also* object.

object-oriented graphics Also called structured graphics. Computer graphics that are based on the use of "construction elements" (graphics primitives), such as lines, curves, circles, and squares. Object-oriented graphics, used in applications such as computer-aided design and drawing and illustration programs, describe an image mathematically as a set of instructions for creating the objects in the image. This approach contrasts with bit-mapped graphics, the other widely used approach to creating images, which represents a graphic as a group of black and white or colored dots arranged in a certain pattern. Object-oriented graphics enable the user to manipulate objects as entire units—for example, to change the length of a line or enlarge a circle—whereas bit-mapped graphics require repainting individual dots in the line or circle. Because objects are described mathematically, object-oriented graphics can also be layered, rotated, and magnified relatively easily. *Compare* bit-mapped graphics, paint program; *see also* graphics primitive.

object-oriented interface A type of user interface in which elements of the system are represented by visible screen entities such as icons (pictorial representations), which are used to manipulate the system elements. For example, the Macintosh Finder presents an object-oriented interface to the file system, representing it by using images of documents, file folders, and disk devices. Object-oriented display interfaces do not necessarily imply any relation to object-oriented programming. *See also* object-oriented graphics.

object-oriented programming Abbreviated OOP. A programming paradigm in which a program is viewed as a collection of discrete objects that are self-contained collections of data structures and routines that interact with other objects. A class defines the data structures and routines of an object; an object is an instance of a class that can be used as a variable in a program. In some object-oriented languages, objects respond to messages, which are the principal means of communication. Other object-oriented languages retain the traditional procedure-call mechanism. *See also* C++, object, Objective-C.

oblique A style of text created by starting a roman font to simulate italics when a true italic font does not exist on the computer or printer. *See also* italic, roman.

OCR *See* optical character recognition.

octal From the Latin *octo*, meaning eight; the base-8 number system, consisting of the digits 0 through 7. The octal system is used in programming as a compact means of representing binary numbers. Because octal consists of eight digits and because 3 bits can form any of eight different combinations, binary numbers are commonly divided into groups of 3 bits for conversion to octal. For example, the binary equivalents of the eight octal digits are as follows:

Binary	*Octal*
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

Thus the binary number *010100011* can be divided into groups of 3 bits, starting from the right and adding an extra 0 at the left, as *001 010 011*. Converted to octal, the number becomes *123*. Although, as this example shows, octal numbers can look like decimal numbers, their values differ because of the different meanings assigned to each number position. In decimal notation, for example, the number *123* means *1X10² plus 2X10 plus 3*. In octal, which is based on powers of 8 instead of powers of 10, the number *123* means *1X8² plus 2X8 plus 3*, or decimal 83.

Because octal works with multiples of 3 bits but microcomputers commonly work in units of 4, 8, 16, 32, and so on, octal is more often encountered in minicomputers and mainframes than in personal computing, where hexadecimal, or base-16, arithmetic is far more widespread. Equivalents and conversion tables for binary, decimal, hexadecimal, and octal are in Appendix E. *Compare* binary, hexadecimal.

OEM *See* original equipment manufacturer.

office automation The use of electronic and communications devices such as computers, modems, and fax machines as well as any associated software to perform office functions mechanically rather than manually.

offline The state in which a device cannot communicate with or be controlled by a computer. Although a device is offline when it is disconnected or turned off, the term is not necessarily synonymous with being either physically disconnected or shut down. A printer, for example, can be offline (temporarily disengaged) yet still be turned on and connected to the computer by a printer cable. *Compare* online.

offline storage A storage resource, such as a disk, that is not currently available to the system.

offset In relative addressing methods, a number that tells how far from a starting point a particular item is located. For example, in the search for a specific data item named within a known area (segment) of memory, an offset is used to tell the microprocessor how many bytes past the beginning of the segment the item is located. Using an offset is similar to saying "The fourth sock is the fifth one from the bottom."

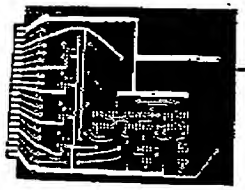
off-the-shelf Ready-to-use, packaged. The term can refer to either hardware or software.

ohm The unit of measure for electrical resistance. A resistance of 1 ohm will pass 1 ampere of current when a voltage of 1 volt is applied. A 100-watt incandescent bulb has a resistance of approximately 130 ohms.

interconnected to perform a particular task. At one level, a computer consists of a single circuit or another, it consists of hundreds of interconnected circuits.

circuit analyzer *Any device for measuring one or more characteristics of an electrical circuit.* Voltage, current, and resistance are the characteristics most commonly measured. Oscilloscopes and multimeters are circuit analyzers.

circuit board A flat piece of insulating material such as epoxy or phenolic resin, on which electrical components are mounted and interconnected to form a circuit. See the illustration. Most modern circuit boards use patterns of copper foil to interconnect the components. The foil layers may be on one or both sides of the board and, in more advanced designs, in several layers within the board. A printed circuit board is one in which the pattern of copper foil is laid down by a printing process such as photolithography. *See also* printed circuit board.



Circuit board.

circuit breaker A switch that opens and cuts off the flow of current when the current exceeds a certain level. Circuit breakers are placed at critical points in circuits to protect against damage that could result from excessive current flow, which is typically caused by component failure. Circuit breakers are often used in place of fuses because they need only to be reset rather than replaced. *Compare* surge protector.

circuit card *See* circuit board.

circuit switching A method of opening communications lines, as through the telephone system, by creating a physical link between the initiating and receiving parties. In circuit switching, the connection is made at a switching center, which physically connects the two parties and maintains an open line between them for as long as needed. Circuit switching is typically used in modern communications on the dial-up telephone network, and it is also used on a smaller scale in privately maintained communications networks. *Compare* message switching, packet switching.

circular list A type of linked or chained list in which processing continues, as in a ring, through all items and returns to the starting point, no matter where that point is located in the list. *See also* linked list.

CISC Pronounced "sisk"; abbreviation for complex instruction set computing. A phrase describing a processor that uses complex instructions at the assembly language level. The instructions can be very powerful, allowing for complicated and flexible ways of calculating such elements as memory addresses. All this complexity usually requires many clock cycles to execute each instruction. *Compare* RISC.

class In object-oriented programming, a generalized category that describes a group of more specific items, called objects, that can exist within it. A class is a descriptive tool used in a program to define a set of attributes or a set of services (actions available to other parts of the program) that characterize any member (object) of the class. Program classes are comparable in concept to the types of pigeonholes people use, often subconsciously, to organize information—one familiar example being the categories *animal, vegetable,* and *mineral,* which define the physical world. Like program classes, such categories define the types of objects they contain and the ways those objects behave. The definition of classes in object-oriented programming is comparable to the definition of types in languages such as C and Pascal. *See also* object-oriented programming.

clean room A room in which dust and other small particles are filtered from the air and in which protective clothing is worn to avoid con-

installation program A program whose function is to install another program, either on a storage medium or in memory. An installation program might be used to guide a user through the often complex process of setting up an application for a particular combination of machine, printer, and monitor. Installation programs are also used when an application is copy-protected and cannot be copied by normal operating-system commands. Such installation programs typically limit the number of copies that can be installed; to move a copy that has been installed on one machine to another machine, the user must deinstall a copy and reinstall it on the other machine (often with the same installation program).

Installer A program provided by Apple with each new release of the Macintosh operating system. The Installer allows the user to install system upgrades and to make bootable (system) disks.

instance In object-oriented programming, an object. For example, if you define a class called *List* and then create (allocate memory for) a *List* object called *mylist*, you've created an instance of the class *List*. *See also* class, instance variable, instantiate, object.

instance variable In object-oriented programming, a variable associated with an object, which is an instance of a class. If a class defines a certain variable, then each instance of that class has its own copy of that variable. *See also* class, instance, object, object-oriented programming.

instantiate In object-oriented programming, to create an instance of a class. *See also* class, instance, object.

instruction An action statement in any computer language (machine, assembly, high-level); although most often used with reference to assembly language programs. Most programs can be broken down into two types of statements: instructions and declarations. *See also* declaration, statement.

instruction code *See* operation code.

instruction counter *See* instruction register.

instruction cycle The process in which a microprocessor retrieves an instruction from memory, decodes it, and carries it out. An instruction cycle consists of two parts, the instruction (fetch) time and the execution (translate and execute) time. An instruction cycle is measured by the number of clock ticks (pulses of a computer's internal timer) that a particular instruction consumes.

instruction mix The assortment of types of instructions contained in a program, such as assignment instructions, mathematical (floating-point or integer) instructions, control instructions, indexing instructions, and so on. Knowing the instruction mix of typical programs is useful to designers of central processing units (CPUs) because it tells them which instructions should be shortened to yield the greatest speed. Similarly, knowledge of instruction mixes is useful to people designing benchmarks because it enables the designers to make benchmarks relevant to real tasks.

instruction pointer *See* program counter.

instruction register A register (a small, high-speed memory circuit) that holds the address of the next instruction to be executed.

instruction set The set of machine instructions that a microprocessor recognizes and can execute. An instruction set includes low-level, step-at-a-time instructions, such as add, subtract, multiply, and divide. Each microprocessor has its own instruction set. In some instances, an instruction set is defined more broadly to include instructions in programming languages as well. *See also* assembler, microcode.

instruction time Abbreviated I-time. The number of clock ticks (pulses of a computer's internal timer) that a microprocessor requires to retrieve an instruction from memory. Instruction time is the first half of an instruction cycle, the second half being the execution (translate and execute) time.

instruction word The length of a machine language instruction, or the instruction itself, which typically contains a code identifying the type of instruction, one or two operands (which might specify addresses), bits used for indexing or other purposes, and occasionally data. *See also* assembler, machine code.

insulator Often called nonconductor. *Any* material that is a very poor conductor of electricity.